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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,046	03/01/2004	Emmanuel Drege	509982005900	1279

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EXAMINER	
HIRL, JOSEPH P	

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/791,046	DREGE ET AL.	
	Examiner	Art Unit	
	Joseph P. Hirl	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *A1*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to an AMENDMENT entered January 2, 2008 for the patent application 10/791,046 filed on March 1, 2004.

2. All prior office actions are fully incorporated into this Final Office Action by reference.

Status of Claims

3. Claims 1-50 are pending in this application.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-50 are rejected under 35 U.S.C. 102(e) as being anticipated by Doddi et al., (USPPUBN 2004/0267397, referred to as **Doddi**).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Claim 1

Doddi anticipates selecting a profile model for use in examining a structure formed on a semiconductor wafer using optical metrology (¶¶ 0006 and 0059; Examiner's Note (EN): ¶ 10. applies), obtaining an initial profile model having a-set of profile parameters (¶ 0026), training a machine learning system using the initial profile model (¶¶ 0006, lines 5-8 and 0059), generating a simulated diffraction signal for an optimized profile model using the trained machine learning system (¶ 0029), wherein the optimized profile model has a set of profile parameters with the same or fewer profile parameters than the initial profile model (¶ 0024, last four lines), determining if one or more termination criteria are met (¶¶ 0052, last four lines and 0057, last four lines), and if the one or more termination criteria are not met, modifying the Optimized profile model and iterating steps c) to e) (¶ 0052, last four lines and 0057, last four lines), wherein the same trained machine learning system is used in iterating step c) (¶ 0065, lines 12-14).

Claim 22

Doddi anticipates a computer-readable storage medium containing computer executable instructions for causing a computer (¶ 0037) to select a profile model for use in examining a structure formed on a semiconductor wafer using optical metrology (¶¶ 0006 and 0059), obtaining an initial profile model having a set of profile parameters (¶ 0026), training a machine learning system using the initial profile model (¶¶ 0006, lines 5-8 and 0059), generating a simulated diffraction signal for an optimized profile model using the trained machine learning system (¶ 0029), wherein the optimized profile model has a set of profile parameters with the same or fewer profile parameters than the initial profile model (¶ 0024, last four lines), determining if one or more termination criteria are met (¶¶ 0052, last four lines and 0057, last four lines), and if the one or more termination criteria are not met, modifying the optimized profile model and iterating steps c) to e) (¶ 0052, last four lines and 0057, last four lines), wherein the same trained machine learning system is used in iterating step c) (¶ 0065, lines 12-14).

Claim 37

Doddi anticipates select a profile model for use in examining a structure formed on a semiconductor wafer using optical metrology (¶¶ 0006 and 0059), an optical metrology device configured to provide a measured diffraction signal (see figure 1 and ¶¶ 0020 and 0021), a first machine learning system trained using an initial profile model having a set of profile parameters (¶¶ 0006, lines 5-8 and 0059); the first machine learning system configured to generate a simulated diffraction signal for an optimized profile model having a set of profile parameters with the same or fewer profile parameters than the initial profile model (¶ 0024, last four lines), wherein if one or more

termination criteria are not met, the optimized profile model is modified (¶ 0052, last four lines and section 0057, last four lines) and the first machine learning system generates another simulated diffraction signal (¶ 0052).

Claims 2, 23

Doddi anticipates obtaining a measured diffraction signal from an optical metrology device (¶ 0004, lines 1-3) and analyzing the simulated diffraction signal and the measured diffraction signal (¶ 0006, lines 3-6).

Claims 3, 24

Doddi anticipates the one or more termination criteria includes a cost function value determined based on the analysis of the simulated and measured diffraction signals (¶ 0067, lines 1-12).

Claims 4, 25, 38

Doddi anticipates the one or more termination criteria includes a preset goodness of fit (GOF) value determined based on the analysis of the simulation and measured diffraction signals (Abstract; EN: GOF is synonymous with matching criterion).

Claims 5, 26

Doddi anticipates obtaining a measured diffraction signal from an optical metrology device (¶ 0006, lines 1-3) and obtaining a profile associated with the measured diffraction signal (¶ 0006, lines 1-6), wherein the one or more termination criteria includes parameter correspondence determined between the profile parameters of the optimized profile model and dimensions of the profile associated with the measured diffraction signal (¶ 0006, last five lines).

Claims 6, 27, 40

Doddi anticipates the one or more termination criteria includes a correlation coefficient determined between a pair of profile parameters of the optimized profile model (correlation coefficient are within the diffraction signals, ¶ 0052).

Claims 7, 28, 41

Doddi anticipates one or more termination criteria includes a sensitivity determined for a profile parameter of the optimized profile model (¶ 0006; EN: ¶ 10. applies; sensitivity is the process of determining a feature of the structure based on one or more parameters).

Claims 8, 29

Doddi anticipates selecting at least one profile parameter of the optimized profile model to eliminate or fix to a value (¶ 0047), and modifying the optimized profile model before iterating steps c) to e) by eliminating or fixing to a value the at least one profile parameter (¶ 0047).

Claims 9, 30, 43

Doddi anticipates training a first machine learning system using a set of training input data and a set of training output data (¶¶ 0006 and 0059), wherein each of the training input data is a profile, model having a set of profile parameters with the same profile parameters as the initial profile model (¶¶ 0006 and 0059), and wherein each of the training output data is a diffraction signal (¶¶ 0006 and 0059).

Claims 10, 31

Doddi anticipates the set of training output data is generated based on the set of training input data using a modeling technique prior to training the first machine learning system (¶ 0059).

Claim 11

Doddi anticipates the modeling technique included rigorous coupled wave analysis, integral method, Fresnel method, finite analysis, or modal analysis (the structure is analyzed, ¶ 0056, line 3).

Claim 12

Doddi anticipates obtaining training input data (0059), generating a diffraction signal with the first machine learning system using the training input data (0059), determining if one or more termination criteria are met (0052, last four lines and section 0057, last four lines), and if the one or more termination criteria are not met, iterating steps g) to i) (¶¶ 0052, last four lines and 0057, last four lines).

Claim 13

Doddi anticipates iterating steps g) to i) (), and adjusting the machine learning system or using new training input data in step g) (¶ 0052).

Claim 14

Doddi anticipates testing the first machine learning system using a second machine learning system (¶ 0047).

Claims 15, 33

Doddi anticipates before testing the first machine learning system, training the second machine learning system using the training input" data for the first machine learning system as training output data for the second machine learning system (¶ 0047) and the training output data for the first machine learning system as training• input data for the second machine learning system (¶ 0047).

Claims 16, 34

Doddi anticipates after training the second machine learning system, generating one or more simulated diffraction signals using one or more profile models as inputs to the first machine learning system (¶ 0047), generating one or more profile models using the one or more simulated diffraction signals generated by the first machine learning system as inputs to the second machine learning system (¶ 0047) and analyzing the one or more profile models generated by the second machine learning system and the one or more profile models used as inputs to the first machine learning system (¶¶ 0047 and 0048).

Claims 17, 46

Doddi anticipates the machine learning system is a neural network (¶¶ 0042 and 0043, line 1).

Claims 18, 47

Doddi anticipates the optical metrology device is an ellipsometer or reflectometer (¶ 0049, line 15).

Claims 19, 48

Doddi anticipates the one or more profile parameters includes one or more of critical dimension measurements, angle of incidence, n and k values, or pitch (¶ 0027, last three lines).

Claims 20, 35, 49

Doddi anticipates if one or more termination criteria are met, selecting at least one profile parameter of the optimized profile model (¶¶ 0052 and 0057) and setting the at least one profile parameter to a determined value (¶¶ 0052 and 0057).

Claims 21, 36, 50

Doddi anticipates at least one profile parameter includes a thickness parameter, and wherein the determined value includes an average thickness measurement (¶ 0045, EN: a thickness parameter relates to one dimension similar to that of a bottom width; wherein does not require a step to be performed since the methodology will of itself provide a mean or average effect; MPEP 2111.04 applies).

Claim 39

Doddi anticipates a profile associated with the measured diffraction signal is obtained (¶ 0006) and wherein the one or more termination criteria includes parameter correspondence determined between the profile parameters of the optimized profile model and dimensions of the profile associated with the measured diffraction signal (¶ 0052 and 0057).

Claim 42

Doddi anticipates the optimized profile model is modified by selecting at least one profile parameter of the optimized profile model to eliminate or fix to a value (¶ 0047).

Claim 44

Doddi anticipates a second machine learning system trained using the training input data for the first machine learning system as training output data for the second machine learning system (¶ 0047) and the training output data for the first machine learning system as training input data for the second machine learning system (¶ 0047).

Claim 45

Doddi anticipates one or more simulated diffraction signals are generated using one or more profile models as inputs to the first machine learning system (¶ 0047), one or more profile models are generated using the one or more simulated diffraction signals generated by the first machine learning system as inputs to the second machine learning system (¶ 0047) and the one or more profile models generated by the second machine learning system are compared with the one or more profile models used as inputs to the first machine learning system (¶ 0047).

Response to Arguments

6. Applicant's arguments filed on January 2, 2008 related to Claims 1-50 have been fully considered but are not persuasive.

In reference to Applicant's argument:

Independent claims 1 and 22 recite modifying the optimized profile model. Independent claim 37 recites that the optimized profile model is modified.

Paragraph [0057] of the Doddi reference was relied upon to reject these claims. Applicants asserted that paragraph [0057] discloses re-training of the machine learning system rather than modifying an optimized profile model.
The present Examiner replied by stating that "Applicant had not defined optimization" and "a training process to achieve an end result of the training is indeed an optimization process."

Applicants note that Applicants' earlier argument was that the Doddi reference failed to disclose modifying the optimized profile model. Thus, even if a training process is viewed to be the same as an optimization process, this does not disclose the specific claim limitation of modifying the optimized profile model. As discussed in more detail below, the training process described in paragraph [0057] includes re-training the machine learning system but does not disclose modifying the optimized profile model as part of the training process.

Examiner's response:

¶ 10. applies. The Examiner has full latitude to interpret each claim in the broadest reasonable sense. Unless the applicant specifically defines a term, the Examiner must view the term in the broadest reasonable was, notwithstanding limitations imposed by the applicant's specification. MPEP 2111.01 applies wherein only issued patents are interpreted in light of the specification. In re American Academy of Science Tech Center, 367 F.3d 1359,1369, 70 USPQ2d 1827, 1834 (*Fed Cir. 2004). Hence, ***optimized process can be interpreted as a training process*** . When training is done within predetermined margin of error, optimization or training has taken place.

In reference to Applicant's argument:

In responding to the earlier rejection of claims 1, 22, and 37, Applicants asserted that paragraph [0057] of the Doddi reference did not disclose modifying or adjusting a profile.

The present Examiner replied by stating that "Applicant has not defined profile", "diffraction signal corresponds with profile", and "output is adjusted based on the diffraction signal comparison would appropriately adjust the corresponding profile."

With respect to the Examiner' s first point (Applicant has not defined profile), there is no explicit requirement for Applicants to define each and every claim term. Instead, claims are interpreted in light of the specification in giving them their "broadest reasonable interpretation." (MPEP 2111.01.) In the present case, profile models are described throughout the specification and depicted in various figures. For

example, paragraph [0021] and corresponding figures 2A-2E of the present application describe and depict various profile models that are characterized using profile parameters, such as height and width. With respect to the Examiner' s second and third points (diffraction signal corresponds with profile and that output is adjusted based on the diffraction signal comparison would appropriately adjust the corresponding profile), paragraph [0057] of the Doddi reference discloses that the diffraction signals are compared to determine if the machine learning system needs to be re-trained. Thus, paragraph [0057] does not explicitly disclose modifying or adjusting the profile.

Applicants note that the standard for inherency is that an inherent characteristic must necessarily flow from the teachings of the prior art. (MPEP § 2112 (IV).) Applicants assert that it does not necessarily flow from the disclosure of diffraction signals being compared that a profile is necessarily modified or adjusted. Instead, as disclosed in paragraph [0057], if the comparison of the diffraction signals is not within a desired or predetermined margin, the machine learning system is re-trained. This disclosed process does not require the profile to be modified or adjusted.

Examiner's response:

¶ 10. applies. While there is there is no explicit requirement for Applicants to define each and every claim term, if applicant does not define such terms then under MPEP2111.01 as cited above, the Examiner is obligated to ***interpret the claims in the broadest reasonable manner*** ... where only ***issued patents are interpreted in light of the specification***. Hence, applicant's argument related profile models is moot. Applicant's claim 1 limits to the ***profile model*** which is similarly adjusted in ¶ 57. Applicant's claim 1 optimized profile model limits to the same profile parameters of the initial profile model. ¶ 57 discloses adjustment in the neural network when a predetermined margin of error has been determined. Applicant's profile of claim 1 related to the optimized profile model may have the same parameters of the initial model and hence not adjustment in the number of parameters.

Examination Considerations

7. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

8. Examiner's Notes are provided with the cited references to prior art to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and spirit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but a link to prior art that one of ordinary skill in the art would find inherently appropriate.

9. Unless otherwise annotated, Examiner's statements are to be interpreted in reference to that of one of ordinary skill in the art. Statements made in reference to the condition of the disclosure constitute, on the face of it, the basis and such would be

obvious to one of ordinary skill in the art, establishing thereby an inherent prima facie statement.

10. Examiner's Opinion: ¶¶ 7.-9. apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Claims 1-50 are rejected.

Correspondence Information

13. Any inquiry concerning this information or related to the subject disclosure should be directed to the Primary Examiner, Joseph P. Hirl, whose telephone number is (571) 272-3685. The Examiner can be reached on Monday – Thursday from 5:30 a.m. to 4:00 p.m.

As detailed in MPEP 502.03, communications via Internet e-mail are at the discretion of the applicant. Without a written authorization by applicant recorded in the applicant's file, the USPTO will not respond via e-mail to any Internet correspondence which contains information subject to the confidentiality requirement as set forth in 35 U.S.C. 122. A paper copy of such correspondence will be placed in the appropriate patent application. The following is an example authorization which may be used by the applicant:

> Notwithstanding the lack of security with Internet Communications, I hereby authorize the USPTO to communicate with me concerning any subject matter related to the instant application by e-mail. I understand that a copy of such communications related to formal submissions will be made of record in the applications file.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, David R. Vincent can be reached at (571) 272-3080.

Any response to this office action should be mailed to:

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Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 273-8300 (for formal communications intended for entry.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have any questions on access to Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

/Joseph P. Hirl/
Primary Examiner, Art Unit 2129

March 26, 2008